LFU11 – Handling and Processing of Digital Examination Quality Images

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1. Scope

1.1.   This procedure is provided to ensure consistent application in the use of digital imaging processes within the Latent Fingerprint Unit (LFU). Digital image processing may be applied whenever it is believed its use will enable the analyst to visualize digital impression evidence more clearly.

1.2.   This procedure will mainly be utilized for images that are processed with Adobe Photoshop. For images that are processed and annotated in Mideo LatentWorks, the Mideo SOP, LFU12, will be followed.

2. Background

2.1.   The LFU will, at times, receive latent fingerprint evidence in the form of digital photographs taken by the Latent Fingerprint Unit Evidence Processing team, the DFS Crime Scene Sciences Unit (CSSU), the DC Metropolitan Police Department, and other submitting agencies. Any hardcopies of these images, printed out by LFU, will be treated as evidence

3. Safety

3.1.   Not applicable

4. Materials Required

4.1.   Hardware

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4.1.1. Input/capture devices

4.1.1.1. Navitar Infinity 2 Digital Camera

4.1.1.2. Epson Perfection V700/V800 Photo Scanner

4.1.2. Output Devices

4.1.2.1. R2000/P400 Inkjet Printers

4.1.2.2. USB drives

4.1.3. Software

4.1.3.1. Adobe® Photoshop®

4.1.3.2. Mideo LatentWorks®

5. Standards and Controls

5.1. Preferences in Adobe® Photoshop® must be set as follows to document the history and any changes made to an image:

5.1.1. Click Edit, Preferences, General

5.1.2. Check the box in front of History log

5.1.3. Change "Edit Log Items" to detailed and "Save"

5.2. The following criteria should be met in order for the LFU to accept a digital latent:

5.2.1. The latent digital image(s) must have a scale present

5.2.1.1. The scale is needed to create a 1:1 image for comparison purposes

5.2.2. The latent digital image(s) must be given a unique identifier

5.2.2.1. An exception is if an identical digital image(s) of the same latent is captured, the duplicated image(s) will not receive a unique identifier.

5.2.3. Analysis and processing will only be conducted on TIFF or RAW file types

5.2.3.1. Examinations should be conducted on lossless compression format images. In the event only a loss compression image is available, an examination may proceed based upon an approved deviation from standard practice.

6. Calibration

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6.1. All digital latent images that are received will be resized and calibrated to ensure a 1:1 image will be produced when the digital latent image is printed. The following procedure will be used to calibrate all images in the Adobe® Photoshop® program:

NOTE: Image calibration performed in Adobe Photoshop, should be done through Mideo. See SOP LFU12, 7.4.2.

6.1.1. Determine whether the scale present in the photo is a metric or inch scale

6.1.1.1. Set the ruler on screen (press ctrl + r if not visible) to correspond to the ruler in the photo (i.e., centimeters if metric, inches if scale is in inches) by right clicking on the ruler and selecting centimeters or inches

6.1.2. Determine the longest length that can be measured on the ruler in the photo

6.1.3. In the toolbar, go to Image, Image size

6.1.4. Ensure "Resample Image" is unchecked

6.1.5. Under "Resolution" type, enter the number from 6.1.2

6.1.5.1 Resolution should always be set to pixels/inch

6.1.6. Click OK

6.1.7. Obtain the ruler tool

6.1.7.1. Right-click on the 6th icon down on the left toolbar

6.1.7.2. Select ruler tool

6.1.8. To ensure accuracy, press caps lock for the cross hairs in the cursor

6.1.9. Measure the distance recorded in 6.1.2

6.1.9.1. Click from the middle of one bar and drag the line across the scale to the middle of the furthest bar (where measurement will end)

6.1.9.2. Unclick

6.1.10. Record or remember the L1 value found at the top center of the screen

6.1.11. Go to Image, Image size

6.1.12. Under "resolution" type in the L1 value

6.1.13. Click OK

6.1.14. Before proceeding, check the image was calibrated correctly by making sure the values that now appear in the width and height fields are the same as in the photo

7. **Procedures**

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7.1.   The analyst will utilize latent fingerprint images from the DCS4 shared drive or from Mideo that need to be analyzed.

      7.1.1.   Examination quality images from the case that are located on the DCS4 shared drive will be copied and imported to Mideo,if they are not already in Mideo, and will be considered the "working copy" to be used for processing.

            7.1.1.1. Images will be renamed following the naming convention outlined in SOP LFU12, 7.2.2.

7.2.   Analysts may process latent images, within Mideo LatentWorks or Adobe Photoshop, when latent image processing may improve the quality of the image. For images that do not require processing, follow SOP LFU12 (Mideo).

      7.2.1.   All processing performed in Adobe Photoshop must be done through Mideo LatentWorks. Changes will be tracked automatically and stored as a part of the image file metadata.

      7.2.2.   Processing is at the analyst's discretion and the following steps may be used:

            7.2.2.1. Evaluate color channels and modes; it may be necessary to adjust color values within the image.

                  7.2.2.1.1. Review the following color modes (color channels) to remove one color value:

            7.2.2.1.1.1.   Image > Mode > RGB

            7.2.2.1.1.2.   Filter > Foray > Chromatic FFT

            7.2.2.1.1.3.   Image > Mode > CMYK

            7.2.2.1.1.4.   Image > Mode > Lab Color [(Lightness channel, Channel a (green + red) or Channel b (green + blue)]

                  7.2.2.1.2. If none of the color modes provide the desired results, then the analyst may need to adjust individual color values to suppress or isolate the background.

                  7.2.2.1.3. The following tools may be used to remove two or more color values as well as adjust the color values so that a color channel may be used to suppress the background:

                      7.2.2.1.3.1. Image > Adjustments > Hue & Saturation (eliminates two or more color values; used

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in conjunction with Calculations to eliminate background noise)

7.2.2.1.3.2. Image > Adjustments > Color Balance

7.2.2.1.3.3. Image > Adjustments > Black & White

7.2.2.1.3.4. Image > Adjustments > Variations

7.2.2.1.3.5. Image > Adjustments Photo Filter

7.2.4.1.4. Image > Calculations (creates a multichannel image used to suppress backgrounds, works well on photographed ninhydrin prints)

7.2.2.2. Convert active color channel to grayscale – after selecting the appropriate color channel (and suppressing the background noise, if required).

7.2.2.2.1. Image > Mode > Grayscale

7.2.2.3. Adjust tonal range and contrast: There are a variety of options for adjusting tonal range and contrast, and the analyst may use one or more of the following options to achieve the desired result:

7.2.2.3.1. Image > Adjustments > Levels (balance tonal range)

7.2.2.3.2. Image > Adjustments > Curves (extraordinary contrast)

7.2.2.3.3. Image > Apply Image (multiply, overlay, screen, etc.)

7.2.2.3.4. Image > Adjustments > Shadow/Highlight (balance tonal range and contrast)

7.2.2.3.5. Image > Adjustments > Exposure (balance tonal range)

7.2.2.3.6. Image > Adjustments > Brightness/Contrast

7.2.2.4. Once the analyst has achieved the desired tonal range and contrast, he/she may want to perform a series of "filter" functions to eliminate "hotspots" that may occur as a result of using an alternate light source with florescent/dye stained latent prints. Or, the analyst may need to "fine tune" the image to eliminate blurring caused by the digital photographic process.

7.2.2.4.1. Filter > Noise > Dust & Scratches (Removes artifacts – using dissimilar pixel values –introduced through instrumentation, etc.)

7.2.2.4.2. Filter > Noise > Reduce Noise (Removes random artifacts – based on edges –introduced through instrumentation, etc.)

7.2.2.4.3. Filter > Sharpen > Unsharp Mask (Sharpens an image by increasing contrast –locates neighboring pixels that differ in value. The lighter pixels get lighter and the darker pixels get darker.)

7.2.2.4.4. Filter > Sharpen > Smart Sharpen (Similar to Unsharp Mask, but provides significantly more control)

7.2.2.4.5. Filter > Sharpen > Sharpen Edges (Like Unsharp Mask, sharpens areas where significant color changes occur, but significantly less control than Unsharp Mask or Smart Sharpen)

7.2.2.5. Feathering Guidelines for Area of Interest Tools (Marquee and Lasso Tools)

7.2.2.5.1. From the Image menu, choose Image Size, and then note the image resolution.

7.2.2.5.2. From the tool bar, choose the appropriate area of interest tool and use the mouse to select the area to be processed.

7.2.2.5.3. From the Select menu, choose Modify, and then choose Feather1.

7.2.2.5.3.1. To determine the Feather Radius, divide the image resolution (PPI) by 100, then multiply that number by 5.

7.2.3. Printing Latent Images 1:1

7.2.3.1. Once an analyst has completed all image processing, the digital images may be printed and used for analysis and a 1:1 comparison.

7.2.3.1.1. NOTE: On-screen analysis and comparison of images is preferred due to the possible loss of quality in printed versions of digital latent prints.

7.2.3.2. The printed image will be treated as evidence and given a unique identifier.

7.2.3.2.1. Printed photos will also be treated similarly to latent lifts and documented according to SOP LFU04.

7.2.3.3. To print a digital latent image:

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7.2.3.3.1. Go to "File", "Print", under "Printer Setup", make sure Epson Stylus Photo R2000 or P400 is selected.

7.2.3.3.2. Go to "Printer Settings", under "Paper Settings" make sure the source is "sheet" and the selected size is 4x6 inches or other appropriate size, if larger.

7.2.3.3.3. Click "OK", then click "Print"

7.2.4. AFIS Submissions

7.2.4.1. For AFIS submissions, it is recommended that the analyst use the digital image for searching, since it should be of a higher quality than the printed image.

7.3. Image Storage

7.3.1. The printed images will be placed in an evidence container, which will be labeled with the DFS # and sealed appropriately according to DOM10. An evidence container will also be added to LIMS and the images will be containerized to be transferred to the latent evidence storage room.

7.4. Case File Documentation

7.4.1. Scans of the printed images used for analysis must be placed in the case file with other case documentation.

7.4.1.1. If high resolution images are requested for discovery, then a copy of the images will be provided.

8. Sampling

8.1. Not applicable

9. Calculations

9.1. Not applicable

10. Uncertainty of Measurement

10.1. Not applicable

11. Limitations

11.1. Not applicable

12. Documentation

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12.1. LFU Examination Worksheets

12.2. LFU Report of Examination

12.3. LIMS Chain of Custody

13. References

13.1. SWGFAST Standard for the Documentation of Analysis, Comparison, Evaluation, and Verification (ACE-V) (Latent) 2/12/10 ver. 1.0

13.2. SWGFAST, Glossary, 5/8/09, ver. 2.0.

13.3. SWGDE/SWGIT "Recommended Guidelines for Developing Standard Operating Procedures" 11/15/2004 ver. 1.0

13.4. Foray Technologies, "An Introduction to Digital Processing of Evidentiary Photography" workbook. 2014